



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/614,051	07/08/2003	Ming-Ren Lin	H1132	7561
45114	7590	12/06/2006	EXAMINER	
HARRITY SNYDER, LLP				RICHARDS, N DREW
11350 Randon Hills Road				
SUITE 600				
FAIRFAX, VA 22030				
				ART UNIT
				PAPER NUMBER
				2815

DATE MAILED: 12/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/614,051	LIN ET AL.
	Examiner	Art Unit
	N. Drew Richards	2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 26 September 2006.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) 7-20 is/are allowed.
- 6) Claim(s) 1-6 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 08 July 2003 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____. | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

1. Note that the term "fin structure" has been interpreted in light of applicant's specification and figures as being a structure as shown in figures 3A and 3B. This interpretation is consistent with applicant's previous arguments and the decision from the Board of Patent Appeals and Interferences.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu in view of Frenette et al. (USPAT 5770490, Frenette), with evidence provided by Wolf et al. (originally cited by Examiner in the examiner's answer mailed 9/7/05, relied upon herein as evidence).

With regard to claim 1:

Wu discloses in figures 6 – 10 a method for forming FinFET devices. Wu discloses in figure 6, figure 7a and paragraph [0019] forming a first fin structure (5), a source region, and a drain region (portions of 5 not covered by gate 9) in a first area of a wafer (1/2). Wu discloses in figure 6, figure 7 and paragraph [0019] forming a second fin structure (6), a source region, and a drain region (portions of 6 not covered by gate

Art Unit: 2815

9) in a second area of the wafer. Wu discloses in figure 7b and paragraph [0021] forming a boron silicate glass layer (10) on the first area and the second area. Wu discloses in figure 7b and paragraph [0021] removing the boron silicate glass layer from the second area. Wu discloses in figure 8b and paragraph [0022] forming a phosphosilicate glass layer (12) on the first area and the second area. Wu discloses in figure 9b and paragraph [0023] annealing the first area and the second area, the annealing causing the first fin structure, source region, and drain region of the first area to be doped with boron and causing the second fin structure, source region, and drain region of the second area to be doped with phosphorus. Note that the first and second "fin" structure are inherently doped as the dopants will diffuse under the edge of the gate, thus doping a portion of the fin structures underneath the gate. See Wolf et al. as evidence of this lateral diffusion. Wu discloses in figure 10 and paragraph [0024] removing the phosphosilicate glass layer from the first area and the second area and removing the boron silicate glass layer from the first area.

As described above, Wu teaches first forming a boron silicate glass layer and then forming a phosphosilicate glass layer. Wu does not teach first forming the phosphosilicate glass layer and then, second, forming the boron silicate glass layer. It is well known in the art that when simultaneously doping source and drain regions using phosphosilicate glass and boron silicon glass the glass layers may be deposited in any order. Whether phosphosilicate glass is used first or boron silicate glass is used first, this would be recognized by the ordinary artisan as a design choice.

Frenette teaches in figures 2 – 5 and column 3, line 28 – column 4, line 10 wherein either phosphosilicate glass or boron silicate glass can be deposited first (layer 10), and the other glass layer (whichever phosphosilicate or boron silicate is not layer 10) is deposited second 34 when doping source and drain regions (40/42 and 44/46).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to first deposit phosphosilicate glass as layer 10 in Wu and then deposit boron silicate glass as layer 12 in Wu in view of the teaching of Frenette in order to use a design choice that is well understood in the art as articulated by Frenette in column 3, line 28 – column 4, line 10. Further, MPEP 2144.04 IV.C. states that changes in a sequence of adding ingredients is obvious. In this case the ingredients are the glass layers, and Frenette clearly teaches in column 3, line 28 – column 4, line 10 that they may be deposited (added) in either order to serve the same purpose of doping source drain regions.

In combination, the phosphosilicate glass layer is formed first. In doing so it is formed in the same manner as Wu teaches forming the first glass layer. That is, the first glass layer is formed adjacent to at least one of a top surface or a side surface of the first fin structure. Since the glass layer is formed directly contacting the gate structure (which has the “fin structure” underneath), the glass layer also necessarily is adjacent to a top and side surface of the first fin structure. The first fin structure, gate structure and first glass layer form a junction that is the configuration of a line. At this line the first glass layer (phosphosilicate glass layer) is adjacent to the top surface and side surface of the first fin structure as claimed.

The combination of Wu with Frenette, wherein layer 10 is phosphosilicate glass and layer 12 is boron silicate glass, will be used when considering the remainder of the claims.

With regard to claim 2, the combination of Wu and Frenette teaches in Wu, paragraphs [0021] and [0022], wherein the forming a phosphosilicate glass layer on the first area and the second area includes depositing phosphosilicate glass to a thickness ranging from about 100 Å to about 500 Å (the overlapping, disclosed range of 100 Å – 2000 Å anticipates the claimed range).

With regard to claim 3, the combination of Wu and Frenette teaches in Wu, paragraphs [0021] and [0022], wherein the forming a boron silicate glass layer on the first area and the second area includes: depositing boron silicate glass to a thickness ranging from about 100 Å to about 500 Å (the overlapping, disclosed range of 100 Å – 2000 Å anticipates the claimed range).

With regard to claim 4, the combination of Wu and Frenette teaches in Wu, paragraphs [0021] – [0023], wherein the first area is an N-channel area (when layer 10 is phosphosilicate glass).

With regard to claim 5, the combination of Wu and Frenette teaches in Wu, paragraphs [0021] – [0023], wherein the second area is a P-channel area (when layer 12 is borosilicate glass).

With regard to claim 6, the combination of Wu and Frenette teaches in Wu, figure7b and paragraphs [0021] – [0022], wherein the removing a phosphosilicate glass

layer from the second area includes masking (11) the first area, and etching the phosphosilicate glass from the second area (when layer 10 is phosphosilicate glass).

Allowable Subject Matter

4. Claims 7-20 are allowed.

5. The following is an examiner's statement of reasons for allowance:

With regard to claims 7-12, the prior art of record fails to teach, disclose or suggest either alone or in combination, the combination of limitations as claimed in claim 7 including where the annealing uniformly dopes the fin structure and the source and drain regions of the N-channel and P-channel devices. The prior art suggests doping the fin structure and source and drain regions but does not teach uniformly doping the fin structure since the entirety of the fin structure of Wu will not be doped.

With regard to claims 13-20, the prior art of record fails to teach, disclose or suggest either alone or in combination, the combination of limitations as claimed in claim 13 including annealing the first and second area to dope the fin structures prior to forming a gate electrode. The prior art teaches annealing to dope the fin structures but teach performing the annealing after a gate electrode is formed on each fin.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

6. Applicant's arguments with regard to claims 1-6 filed 9/26/06 have been fully considered but they are not persuasive.

Applicant argues that Wu teaches the gate electrode being interposed between the phosphosilicate glass layer and the fin structure and thus does not teach the phosphosilicate glass layer being formed adjacent to at least one of a top surface or a side surface of the first fin structure. This is not persuasive. As explained in the rejection above, the glass layer is formed adjacent to the top and side surface of the fin structure along the interface of the fin structure with the edge of the gate. The glass layer is not formed adjacent to the entire top surface or side surface but it is formed adjacent to an edge of the surfaces and thus reads on the invention as claimed.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

Art Unit: 2815

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



N. DREW RICHARDS
PRIMARY EXAMINER